

**AMENDMENTS TO THE SPECIFICATION**

Please amend the specification as follows:

**Amend the Paragraph beginning on page 1, line 6, to read as follows.**

The present invention concerns the methods of producing a grid for a battery electrode plate and producing a battery. This application is based upon the Japanese patent application 2002-232556. With this statement, all the content of the Japanese patent application 2002-232556 is included as cited reference in this present Patent Description.

**Amend the Paragraph beginning on page 9, line 19, to read as follows.**

Figure 1a shows an embodiment of the present invention, illustrating the disk cutters of the top and bottom disk cutter rolls forming slits in the lead sheet when the valleys of the top and bottom middle disk cutters overlap, with front views of enlarged vertical sections of the relevant part. Figure 1b shows an embodiment of the present invention, illustrating the disk cutters of the top and bottom disk cutter rolls forming slits in the lead sheet when the ridges of the top and bottom middle disk cutters overlap, with front views of enlarged vertical sections of the relevant part. Figure 1c shows an embodiment of the present invention, illustrating the disk cutters of the top and bottom disk cutter rolls forming slits in the lead sheet when the valleys of the top and bottom middle disk cutters overlap, with front views of enlarged vertical sections of the relevant part. Figure 1 shows an embodiment of the present invention, illustrating the process of the disk cutters of the top and bottom disk cutter rolls forming slits on the lead sheet, with front views of

~~enlarged vertical sections of the relevant part.~~ Figure 2 shows an embodiment of the present invention with a side view that illustrates the composition of an edge disk cutter. Figure 3 shows an embodiment of the present invention with an enlarged oblique perspective view of the relevant part of an edge disk cutter. Figure 4 shows an embodiment of the present invention with an enlarged oblique perspective view of the part close to the edge node in a grid in which the slits formed on the lead sheet have been expanded. Figure 5 shows an embodiment of the present invention with front views of enlarged vertical sections of the relevant part that shows the process of forming slits on a lead sheet using the edge disk cutter whose peripheral side face of the valley is positioned below the upper surface of the guide. Figure 6 shows an embodiment of the present invention with front views of enlarged vertical sections of the relevant part that shows the process of forming slits on a lead sheet using a disk cutter of a different shape. Figure 7 is a conventional art example in a side view that shows a disk cutter and the composition of the periphery of this disk cutter. Figure 8 is a conventional art example with a side view that shows the process of forming slits on the lead sheet using the disk cutter with a rotary type expander. ~~Figure 9 shows a conventional art example with front views of enlarged vertical sections of the relevant part that shows the process of forming slits on a lead sheet using the disk cutter of the top and bottom disk cutter rolls.~~ Figure 9a shows an embodiment of the conventional art example, illustrating the disk cutters of the top and bottom disk cutter rolls forming slits in the lead sheet when the valleys of the top and bottom middle disk cutters overlap, with front views of enlarged vertical sections of the relevant part. Figure 9b shows an embodiment of the conventional art example, illustrating the disk cutters of the top and bottom disk cutter rolls

forming slits in the lead sheet when the ridges of the top and bottom middle disk cutters overlap,  
with front views of enlarged vertical sections of the relevant part. Figure 9c shows an  
embodiment of the conventional art example, illustrating the disk cutters of the top and bottom  
disk cutter rolls forming slits in the lead sheet when the valleys of the top and bottom middle  
disk cutters overlap, with front views of enlarged vertical sections of the relevant part. Figure  
10 shows a conventional art example with a side view that shows the composition of an edge  
disk cutter. Figure 11 is a conventional art example in an enlarged oblique perspective view that  
shows the composition of an edge disk cutter. Figure 12 is conventional art example with an  
enlarged oblique perspective view of the part close to the edge node in a grid in which the slits  
formed on the lead sheet have been expanded.

**Amend the Paragraph beginning on page 11, line 10, to read as follows.**

The present embodiment of the edge disk cutter (4) has the same configuration as the conventional art examples in that ridges (4a) and valleys (4b) are alternately placed on its outer periphery, as indicated in Figures 2 and 3. However, unlike the case of middle disk cutter (1), the shape of a ridge (4a) of the edge disk cutter (4) is not necessarily ridge-like. In the examples in Figures 2 and 3, a ridge (4a) of the edge disk cutter (4) is formed by the peripheral side face composed of the reference circumferential face of a fixed radius with its center at the center of axle of an edge disk cutter (4). A valley (4b) is placed between such ridges (4a). ~~No grooves (4e) are formed at valleys (4b) (edge node forming parts) as in the conventional art examples. Instead notches (4d), formed so as to be dented further to the center of axle than the ridges (4a) adjacent~~

~~to both ends, penetrate the edge disk cutter (4) in its thickness direction. At valleys (4b) (edge node forming parts), grooves (4c) as in the conventional art examples are not formed and notches (4d), dented to the center of axle than the ridges (4a) adjacent to both ends and penetrating the edge disk cutter (4) in its thickness direction, are formed.~~ This means that the parts excluding the notches (4d) in an edge disk cutter correspond to ridges (4a), in the examples in Figures 2 and 3. The interval between valleys (4b) for the edge disk cutter (4) in the present embodiment is twice as long as that between valleys (1b) of the middle disk cutter (1) of Figure 7 or that between valleys (4b) in the conventional edge disk cutter (4) of Figure 10. Thus in the present embodiment, valleys (4b) only exist in the same positions as half of the valleys (1b and 4b), among the valleys (1b) of the middle disk cutter (1) and those (4b) of the conventional edge disk cutter (4), where grooves (1c and 4c) are found on the same side of the disk cutter.

**Amend the Paragraph beginning on page 8, line 31, to read as follows.**

The sixth item of the present invention concerns the method of producing a grid for a battery electrode plate, dependent on the first item. It is characteristic in that an inclined [[plane]] surface is formed that contacts with a ridge of said edge disk cutter at least at a part of contact with said notch and approaches a rotation shaft of the edge disk cutter as it proceeds toward the outside of said disk cutter cluster along said rotation shaft.

**Amend the Paragraph beginning on page 12, line 12, to read as follows.**

Notice that the front side of an edge disk cutter (4) in Figure 3 (Side A) is flat up to the point of the peripheral side face which forms ridges (4a), and is not inclined even near the ridges (4a), while the reverse side (Side B) constitutes an inclined [[plane]] surface near the ridges (4a). However, the present invention is not restricted to such a case. Namely, the whole area near the ridges (4a) of Side B of the edge disk cutter in Figure 3 need not necessarily be inclined. All that is required is that there exist inclined [[planes]] surfaces only near valleys (4b) among the ridges (4a).

The present invention is not limited to the case, as in the above described example, wherein ridges (4a) are formed from the peripheral side face. Cases wherein there is no peripheral side face and the inclined [[plane]] surface near the ridge (4a) of Figure 3 reaches Side A of Figure 3 are included in the present invention, as the effects of the present invention will be obtained. Figure 1(b) exemplifies such cases. However, it is preferable to have a peripheral side face as in Figure 3, which will make the edge disk cutter more resistant against chipping.

**Amend the Paragraph beginning on page 19, line 12, to read as follows.**

Grids under the present invention were produced in the same manner as Example 1 except that the amount of protrusion was set to 50% of the lead sheet thickness for the reference circumferential face of the edge disk cutter (4) (ridges (4a) of the edge disk cutter (4)) from the reference plane of the disk cutter cluster toward the side of the cutter roll opposed to the disk cutter roll equipped with the same edge disk cutter and that grids were produced both in the case

wherein an inclined [[plane]] surface was formed that contacts with the ridges (4a) of the edge disk cutter (4) and approaches the rotation shaft as it proceeds in the direction toward the outer part of the disk cutter cluster along the rotary shaft of the edge disk cutter (the case of Figure 3) and in the case wherein no inclined [[plane]] surface was formed and the ridges (4a) were formed from the outer periphery that is of the same thickness as the edge disk cutter (4). Batteries were produced and were tested in the same way as Example 2 using these grids. The results of these tests are shown in Table 3.

(Table 3)

Whether or not inclined [[planes]] <u>surfaces</u> exist that contacts edge disk cutter ridges	Ratio in thickness of thinnest part of edge node against original sheet after slit forming (%)	Life cycles (100 when there is no inclined [[plane]] <u>surface</u> )	Rupture rate at edge node after 300 cycles (100 when there is no inclined [[plane]] <u>surface</u> )
Yes	64	104	71
No	60	100	100

It can be seen from Table 3 that the life cycles of a lead-acid battery improved and rupture at the edge node (3d) is better suppressed when there are inclined [[planes]] surfaces that contact with the ridges (4a) of the edge disk cutter (4).

<Example 5>

A grid under the present invention was produced in the same manner as Example 1 except that the amounts of protrusion were varied in the range from 0 - 50% of the lead sheet thickness for the reference circumferential face of the edge disk cutter (4) (ridges (4a) of the edge disk cutter (4)) from the reference plane of the disk cutter cluster toward the side of the cutter roll opposed to the disk cutter roll equipped with the same edge disk cutter and that edge disk cutters (4) were used with no inclined [[plane]] surface that contacts with the ridges (4a) of the edge disk cutter (4) and approaches the rotation shaft as it proceeds in the direction toward the outer part of the disk cutter cluster along the rotary shaft of the edge disk cutter. Batteries were produced and were tested in the same way as Example 2 using these grids. The results of these tests are shown in Table 4.